




FEELPURE™ system INSTALLATION, OPERATION & MAINTENANCE BOOK

“ON-BOARD” dosing version

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		Date: 10/06/2008
		Authors: F.Ceriani – F.Attià

IMPORTANT NOTES

Documentation information

The information, instructions and recommendations contained in this manual (2 copies of which are supplied with the product) are essential for the correct installation, operation and maintenance of the Feelpure™ system, updated to the date shown on the manual. Any updates or changes to this manual are available on the internet website: www.pirelliecotecnology.com.

One copy of this manual is for the product installer, and the other is for the customer and should be carefully kept. If the product is installed on a vehicle, the manual must be kept on board the vehicle itself.

Before proceeding with the installation of the product, it is essential to read the entire manual carefully and understand it fully, and also check if any updates are available on the internet website or by contacting Pirelli Eco Technology S.p.A. Customer Assistance by email at: service.ecotechnology@pirelli.com

If you are unsure of anything at all about the installation procedure and/or the operation and/or maintenance of the product, you should contact Pirelli Eco Technology S.p.A. Customer Assistance at the email address above.

Installation and maintenance of the product, as well as any operation carried out on it, must be done only and exclusively by qualified personnel with the necessary skills for performing these operations, using the correct tools and fully observing the instructions and recommendations in this manual, in addition to all safety regulations and precautions.

The installation, operation and maintenance of the product, as well as any intervention on it, are the sole responsibility of the person carrying them out, and Pirelli Eco Technology S.p.A. is expressly excluded from any responsibility.

In some countries the product has been homologated to work with the original components of the product, comprising the CAM FBC catalysing additive provided by Pirelli Eco Technology for the first filling and available for subsequent refills. Therefore, Pirelli Eco Technology S.p.A. recommends you use original parts (including the additive) or parts with technical and functional specifications that conform completely to the originals and especially, but not only, in terms of composition, physical dimensions, type, resistance and materials.

Failure to observe these information notices and the recommendations contained in this document may lead to malfunction, breakdown, breakage etc. and also the danger of damage to objects and/or personal injury, as well as voiding the Pirelli Eco Technology S.p.A. warranty specified on the following page.


IMPORTANT NOTES

Safety

The majority of accidents deriving from the operation, maintenance and repair of the product are caused by failure to observe the basic safety rules or precautions. Accidents can often be avoided by anticipating potentially dangerous situations before the accident happens. You should always be alert to potential dangers. You must also have the proper training, skills and tools required to carry out these operations correctly.

Do not begin installation of this product until you have read and understood all the information given in this document.

Pirelli Eco Technology cannot predict all possible circumstances that could involve potential dangers. For this reason the attention notices in this document and on the product do not cover all eventualities. If during the various operations you adopt procedures, tools or methods that are not explicitly recommended by Pirelli Eco Technology, it is essential to make sure that the work is performed in full observance of your own personal safety and that of others. You must also make absolutely sure that the engine/vehicle on which you are working is not damaged and is not made dangerous as a result of procedures you choose to follow.

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Pirelli Eco Technology Warranty

Conditions

Pirelli Eco Technology S.p.A. guarantees the quality of the materials used in this product and their workmanship, and also guarantees the product's conformity to the technical specifications contained in this manual.

The existence of any defects must be verified by Pirelli Eco Technology S.p.A.'s technicians.

If the product is defective, Pirelli Eco Technology S.p.A. undertakes exclusively to repair or replace, at its final and unquestionable discretion, the product or part of the product that is recognised to be defective.

If Pirelli Eco Technology S.p.A. or one of its network of assistance centres listed on the internet website www.pirelliecotechnology.com is requested to carry out a repair or replacement under warranty, the product said to be defective must be sent, post free, to Pirelli Eco Technology S.p.A. or to one of its network of assistance centres, which will return it post free.

If Pirelli Eco Technology is requested for a repair or replacement under warranty outside its workshops or outside the workshop of one of its authorised centres and Pirelli Eco Technology S.p.A. agrees to the request, all labour costs and shipping costs will be the exclusive responsibility of the party making the request.

The warranty does not cover:

- All those parts that, by their nature or use, are subject to wear or consumption and especially those parts that are subject to periodic replacement
- Normal maintenance operations and/or adjustment of products
- Components that are not original Pirelli Eco Technology S.p.A. parts

The warranty expires at the moment in which one of the following three events occurs:

- Twelve months pass from the date of installation of the product as shown in the installation sheet
- The product is used for 200,000 km
- The product is operated for 2,000 hours

In addition, the warranty becomes void and withdrawn in each of the following situations:

- If Pirelli Eco Technology S.p.A., within five working days after the installation of the products and/or at the carrying out of the periodic checks specified in this manual, has not received a copy of the sheet as specified in this manual, duly completed and signed,
- If the defects and faults have not been reported according to legislation,
- If the request for repair or replacement under warranty is not accompanied by copies of the sheets as per letter a) and/or the serial number of the products has been rendered illegible or removed or altered,
- If the product has been modified or in any way interfered with or if equipment, parts or other accessories that are not original Pirelli Eco Technology S.p.A. or not of corresponding quality have been mounted, as per the information notices above,
- If the product has not been stored, installed, operated or subjected to maintenance in conformance with the specifications contained in this manual,

- If fuels and/or lubricants have been used that are different from those specified by the vehicle/engine Manufacturer on which the products are installed, or additives other than those specified in this manual,
- If the operation and maintenance recommendations requested by the vehicle/engine Manufacturer, on which the products are used, have not been followed.

The carrying out of repairs or replacements or provision of spare parts does not extend or renew the original date of expiry of the warranty.

The duration of the warranty for spare parts and accessories is 6 months from the delivery.

The repair or replacement of the defective product terminates the warranty provided by Pirelli Eco Technology S.p.A. The company provides no further warranty, nor does it assume any other undertakings, and, except where specified by law, expressly excludes any responsibility of Pirelli Eco Technology S.p.A. for damages of any kind or nature, direct or indirect, for any accident to persons or objects, indemnities, compensation, including any failure to use the product and/or vehicle or engine on which the product is used and, in any case, any and all responsibility originating from the product.

Feelpure™ system installation & warranty form

The Feelpure™ installation form (enclosed with this manual: see page 35) must be filled in, stamped and countersigned by the workshop that installed the system and by the owner of the vehicle.

A copy of the document must be kept on board the vehicle with the vehicle's other identification documents.

A copy of the document (hardcopy or in electronic format) must be sent to Pirelli Eco Technology by fax [+39.02.938.74.664](tel:+39.02.938.74.664) or by e-mail service.ecotechnology@pirelli.com and must subsequently be sent by post within 5 working days of the date of installation.

A copy of the document must also be kept by the installer.

This is essential for the warranty to be recognised by the Pirelli Eco Technology organisation, based on the regulations that govern it (see the previous paragraph).

To follow the maintenance programme specified by the vehicle/engine Manufacturer is essential for the product to be used correctly and in conformance with Pirelli recommendations. This is therefore an essential precondition in order to be able to get the warranty under the terms of the “sale and use” conditions.

1) How the Feelpure™ system works

The Feelpure™ system reduces particulate emissions from diesel engines by over 95%, and can be used on commercial vehicles, transport vehicles and construction site machines on all engine classes from EURO 0 to EURO 4.

The Feelpure system is comprised mainly of:

- A. A muffler, which in turn is comprised of:
 - A filter (particulate trap) enclosed in a special stainless steel canning
 - Inlet and outlet endcans for exhaust gases
 - Specific gaskets placed between the filter and the endcans
 - Locking V-clamps
- B. Additive dosing system (12/24V depending on the application)
- C. Backpressure control kit (including the electronic control unit - ECU)
- D. CAM FBC additive tank (of adequate capacity for the engine and its diesel consumption)
- E. Installation kit (specific for TRUCKS, BUSES, EARTH MOVING MACHINES etc.)
- F. A suitable supply of CAM FBC catalysing additive (supplied in 5 litre cans)
- G. Thermal insulation kit for the pipe connecting the engine/turbocompressor to the muffler (OPTIONAL)

Also supplied with the system are two copies of this manual (one for the installer and one for the vehicle owner) and a CD containing the necessary dedicated software.

The filter is made of a honeycomb structure in silicon carbide (SiC) through which the exhaust gases are filtered. The particulate, made up mainly of particles of carbon of varying dimensions, is kept back, right down to particles of the smallest dimensions.

The electronic control unit (ECU) monitors the level of backpressure in the exhaust, and regulates the dosing of the additive (via a metering 12/24V pump) and stores the operational parameters of the system.

A tank installed on the vehicle contains the necessary additive for activating the regeneration of the filter. This iron-based additive is dissolved into the diesel fuel, reducing the ignition temperature of the residual carbon to 250°C - 280°C instead of the normal 600°C.

It is not necessary to use special diesel fuels (for example ULSD, Ultra Low Sulphur Diesel).

The limited quantity of additive dosed into the diesel fuel does not affect its physical/chemical characteristics, which remain in total conformance to the UNI-EN590 standard.

For further information on the characteristics of the CAM FBC catalysing additive, consult the product safety sheet enclosed with every shipment of the product and which is also available on the internet website www.pirelliecotecnology.com.

The maintenance intervals specified by the engine/vehicle manufacturer for the other auxiliary systems (diesel injection, air intake, lubrication, ecc) remain unchanged and should be strictly followed.

Specifically, it must be guaranteed that:

- The smoke opacity of the exhaust gases measured upstream of the filter is lower than 1.7 K [m-1]
- The lube-oil consumption is lower than 800g/1000 km (0.25% of the fuel consumption)
- The temperature of the exhaust gases at the inlet side of the muffler must be kept at over 300°C for at least 5% of the running time of the engine.

2) Basic selection/dimensioning guidelines for the Feelpure™ system

Muffler

All muffler designs for Feelpure™ systems for **RETROFIT** application are developed by Pirelli Eco Technology based on the original chassis, with tailor-made solutions. The installation of these systems is actually a replacement of the original muffler, and matches the original in terms of size, supports and mountings.

For special vehicles/applications, **STANDARD** systems are offered which are then adapted, via adjustment operations, to replace the original muffler.

Every Feelpure™ system has a “*SAP code*” which is used for logistical/administrative purposes, and a “*MUFFLER code*” which is necessary for its recognition for homologation/road circulation purposes. This second code is found on the inlet endcan for exhaust gases (which is part of the muffler) and it is also essential for identifying the system for maintenance purposes and for coverage by the warranty.

Filter / Filtering Cartridge / Particulate trap

In all cases the filter (particulate trap) is dimensioned on the basis of the engine characteristics (displacement, power, emissions level).

As a basic rule for choosing the necessary filter, take the displacement of the engine (in litres) and double it to arrive at the minimum allowable volume. With this information refer to the table below.

FILTER CODE	FILTER DIAMETER [INCHES]	FILTER LENGTH [INCHES]	FILTER VOLUME [LITRES]	ENGINE DISPLACEMENT [LITRES]	ENGINE POWER* [kW / hp]
F751115N71	7.5	11	8	4	100 / 135*
F751415N71	7.5	14	10	5	130 / 180*
F101015N71	10	10	12.9	6.5	175 / 240*
F101215N71	10	12	15.5	8	215 / 290*
F101515N71	10	15	19.3	10	255 / 345*
F111215N71	11	12	19.6	10	265 / 360*
F111415N71	11	14	22.8	14	315 / 430*

As an example, an IVECO CURSOR 7.8 litre engine needs a F101209N71 cartridge with a useful filtering volume of 15.5 litres.

A medium-sized truck with an IVECO TECTOR 5.9 litre engine needs a F101015N71 cartridge with a useful filtering volume of 12.9 litres.

A commercial vehicle like an IVECO DAILY 2.8 litre engine needs a F751115N71 cartridge with a useful filtering volume of 8 litres.

In addition to the choice of filter/system, it is also necessary to determine and set the additive dosing frequency in the operation settings/parameters of the control unit (see section 10.5 and table on page 31 – Additive Dosing Frequency ECU settings).

3) Replacing the original muffler

Assembly of the Feelpure™ system involves replacing the original muffler and mounting a number of additional components, including the additive tank and the electronic control unit (see list in section 1.)

The description of the operations to be carried out is divided into sections for each main component and also taking account of the connections between them.

***Before beginning to assemble the system,
read ALL of the following instructions.***

NB in every threaded connection to be made in the assembly, the male-threading must be sealed with an adequate quantity of Teflon®.

The procedure for removing/installing the muffler described below is obviously generalised. There may be small differences between the systems (see the description of Feelpure™ RETROFIT and STANDARD in section 2). For notes on safety, see the Important Notes section at the start of this manual.

- 1) Test the smoke opacity of the exhaust gases. The value must be lower than 1.7 K [m-1].
- 2) Remove the original muffler and check the reliability of the existing supports and mountings, and if they are not adequate rectify them via adjustment, observing good technical standards and normal workshop practices.
- 3) Position the Feelpure™ replacement muffler on the support brackets.
- 4) Connect the inlet and outlet pipes to the intake and outflow sides of the replacement muffler **taking care to position the identification plates welded on the inlet endcan and on the filter in a position where they can easily read.** If the dimensions of the original pipes are different from those of the Feelpure™ muffler, apply the necessary reductions.
- 5) Fix the brackets supplied with the replacement muffler to the original supports and mountings on the vehicle, using the Pirelli components if these are supplied, or via suitable adjustments.
- 6) When carrying out the installation, observe the vehicle/engine Manufacturer's normal requirements and/or specifications (e.g. ensure the minimum distance from the ground, distance from electrical wires, etc.). Also, adequate thermal insulation must be used at any points which could come into direct contact with the instruments on board.
- 7) If it is supplied with the Feelpure™ muffler, use the special thermal insulation kit for the pipe that run from the engine/turbocompressor to the muffler.

Some examples of muffler mountings are shown on the next pages:

IVECO MAGIRUS 260



SETRA S215



SETRA S210



IVECO 370 L25 L 30



MERCEDES INTEGRO



MAN 41.464



IVECO EURORIDER



IVECO 580



IRISBUS 491.18 EURO 3



IVECO 480



BREDA MENARINI M220 E



IVECO 491.12 EURO 2



MERCEDES O 303



PALA ZAXIS 210N



DAF 95.430 EURO 2



IVECO TRAKKER VERT with AUX



INBUS 240



SETRA S300 NC



4) Installing the CAM FBC additive tank

Numbers given in brackets after components refer to the positions indicated in the diagram on the following page, ADDITIVE DOSING LINE.

These components are supplied together with the Feelpure™ system in the ADDITIVE DOSING KIT.

- 1) Via the 1/4"-F threaded sleeve welded to the additive tank, mount the 1/4" stopcock (1) and on this mount a 6 mm hose connection (2)
- 2) Fix the 12/24V additive pump (6) to the support plate welded to the tank using the antivibration hose-clamp.
- 3) With two lengths of the additive Parker hose (3 and 5) and four metal clamps, connect the additive filter (4) on one side to the hose connection screwed onto the stopcock, and on the other side to the dosing pump (6).
- 4) Screw the level sensor (8) onto its support (**make sure that the arrow on the level gauge is pointing downwards**) removing the nut and the rubber sealing (if present) and interposing the special copper washer. Pass the two electrical wires connected to the level sensor through the support. Seal where the wires come out from the support with an adequate amount of silicone, and make sure there is no leakage into the tank.
- 5) Position the 55 mm Teflon® white gasket seal (supplied with the kit) on the flanged hole in the upper side of the tank. Then insert the sensor into the hole on the upper side of the tank and tighten the three M4x10 screws to affix the support.
- 6) Position the tank and fix it using four M8 screws in one of the spaces in the vehicle (luggage compartment, spare-wheel storage space that may be unused, 'dead' spaces between the fuel tank and the inside wheel arch, etc). If necessary clamp it in a convenient, protected position close to the chassis.

***Under no circumstances must the tank be installed
in direct contact with heat sources.***

Bear in mind that the flash-point of the CAM FBC additive is > 60°C. For further details see the safety data sheet for the additive, which is enclosed with every delivery and is also available on the internet website www.pirelliecotecnology.com.



5) Assembling the backpressure measurement metal pipe

Numbers given in brackets after components refer to the positions indicated in the diagram on the following page, ECU AND PRESSURE LINE.

These components are supplied together with the Feelpure™ system in the PRESSURE CONTROL KIT.

- 1) Connect the 6mm metal pipe (11), after verifying with a burst of compressed air that it is not plugged, to the pipe-tong (12) which was previously installed on the sleeve positioned on the inlet endcan of the replacement muffler (13)
- 2) To one side, prepare the "Tee" subgroup as follows:
 - On the "ECU-protection" gas filter inlet point (9), graft a 1/4" (6 mm) pipe-tong (10)
 - In the other opening, insert the 1/4"M nipple (8) and on this insert the female 1/4" T (5)
 - In one of the free openings, insert the 1/4"M–1/8"F reduction (4) and the 1/8" (3 mm) hose adapter (3) for connecting the electronic control unit (1) via the polyurethane pipe (2) supplied with the INSTALLATION KIT.
 - In the remaining free opening insert the 1/4" ball valve (6) and the 1/4" (6 mm) hose adapter (7)
- 3) Fix the "Tee" subgroup in a protected position that is easily reachable for manual checking of the backpressure (for example, in the engine compartment) however over the muffler to prevent condensation problem on the "ECU protection" gas filter.
- 4) Shape, cut to the right length and connect the metal pipe (11) to the inlet side of the "Tee" group via the 1/4" pipe-tong (10) mounted on the "Tee".

6) Connecting the additive line to the fuel injection system

Carrying out the tasks described in this section will enable dosing of the CAM FBC catalysing additive into the fuel line by means of the 12/24V pump.


See the diagram for section 4 which also applies to this section.

- 1) Insert the additive Parker hose into the 20mm-diameter corrugated sheath (supplied with the INSTALLATION KIT), and bring it from the area where the additive tank is supported to the diesel tank area, preferably using the existing passages in the chassis.
- 2) Connect the additive hose (7) to the outflow of the metering pump (6) and fix it with a metallic hose-clamp.
- 3) At the most convenient point, intercept the fuel intake line to the engine, preferably at the connections to the manual priming pump or at those on the diesel pre-filter.

The connection must be made on a length of pipe where the fuel pressure is lower than 200mbar.

Prepare the connection between the additive line and the diesel line, preferably with one of the "Tee" junctions supplied with the INSTALLATION KIT (use the most suitable one for the application, diameter and material used in the diesel line).



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7) Making electrical connections

Using the components supplied with the INSTALLATION KIT (electrical wires, corrugated sheaths, rapid connections, etc.) make the electrical connections described below, taking care to follow the usual good technical regulations and normal workshop practice.

- 1) Install the electronic control unit (ECU) in a protected position that cannot be reached by the driver or by other persons using the vehicle (e.g. space under the dashboard, glove compartment, magnetothermal panels or in some other position, and if necessary protected by the casing supplied by Pirelli Eco Technology).
- 2) Sheath the two bipolar wires for the connection of the dosing pump (black wires) and additive level gauge (grey wire and red wire, the latter connected to the positive terminal on the battery) and run them from the additive tank to the electronic control unit (ECU) using the existing passages in the chassis and using one of the existing passages for bringing the wire into the driving compartment, if necessary.
- 3) Install the LED on the dashboard in a place where the driver can see it and attach the adhesive label (supplied with the KIT) with the LED blinking codes that show the operational state of the system.
- 4) Make the electrical connections according to the diagrams shown in the manual for the electronic control unit (see also the following two pages: n°7 and n°17 of the ECU manual supplied with the kit).

In detail, the connections required are:

- 12/24V connected directly to the battery (red wire to the ECU through a fuse supplied with the KIT)
- 12/24V engine running signal (yellow wire to the ECU)
- Ground – GND (black wire to the ECU)
- Additive level gauge (red wire from positive terminal of the battery and grey wire from ECU)
- Driver LED (white and brown wires from the ECU)
- Additive dosing pump (black wires from the ECU – indifferent reciprocal connection)

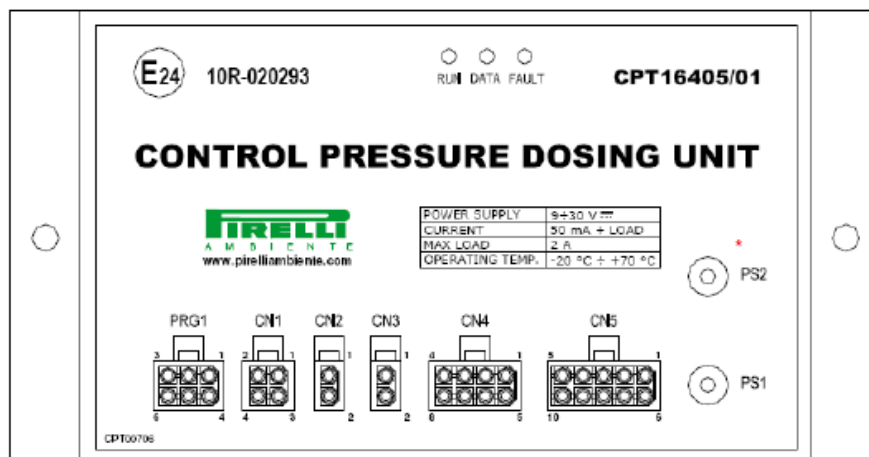
Note: The BLUE wires (on the OUTPUT side of the control unit) and the GREEN and PURPLE wires (on the INPUT side of the control unit) must be cut and properly isolated.

8) Connecting the “manual backpressure test” joint to the control unit

See the diagram for section 5, ECU AND PRESSURE LINE, which also applies to this section.

- 1) Insert the blue polyurethane pipe (2) into the 20mm diameter corrugated sheet (supplied with the INSTALLATION KIT).
- 2) Run the pipe from the control unit (1) to the “manual backpressure test” joint (installed and clamped according to the instructions in section 5) possibly using the same passages used for the electrical cables.
- 3) Connect the polyurethane pipe (2) to the socket on the control unit (1).
- 4) Connect the other end of the polyurethane pipe (2) to the 3 mm hose adapter (3) positioned on the "Tee" connection (5) installed and clamped according to the instructions in section 5.

PIN CONFIGURATION



PRG1	PROGRAMMING/INSPECTION CONNECTOR		
1	5 VCC 100 mA	OUT	SERVICE OUT
2	TX	OUT	DATA TRANSMISSION
3	RX	IN	DATA RECEPTION
4	DTR	IN	DEVICE RESET
5	RTS	IN	DEVICE PROGRAMMING
6	GND	IN/OUT	GND

CN1	AUXILIARY SERIAL		
1	24 VCC 500 mA	OUT	SERVICE OUT
2	TX	OUT	DATA TRANSMISSION RS232 (FOR REMOTE DISPLAY)
3	RX	IN	DATA RECEPTION RS232 (FOR REMOTE DISPLAY)
4	GND	IN/OUT	GND

CN2	ALARM OUT		
1	GND	IN/OUT	GND
2	VCC	OUT	CONTROL OUT 250 mA MAX

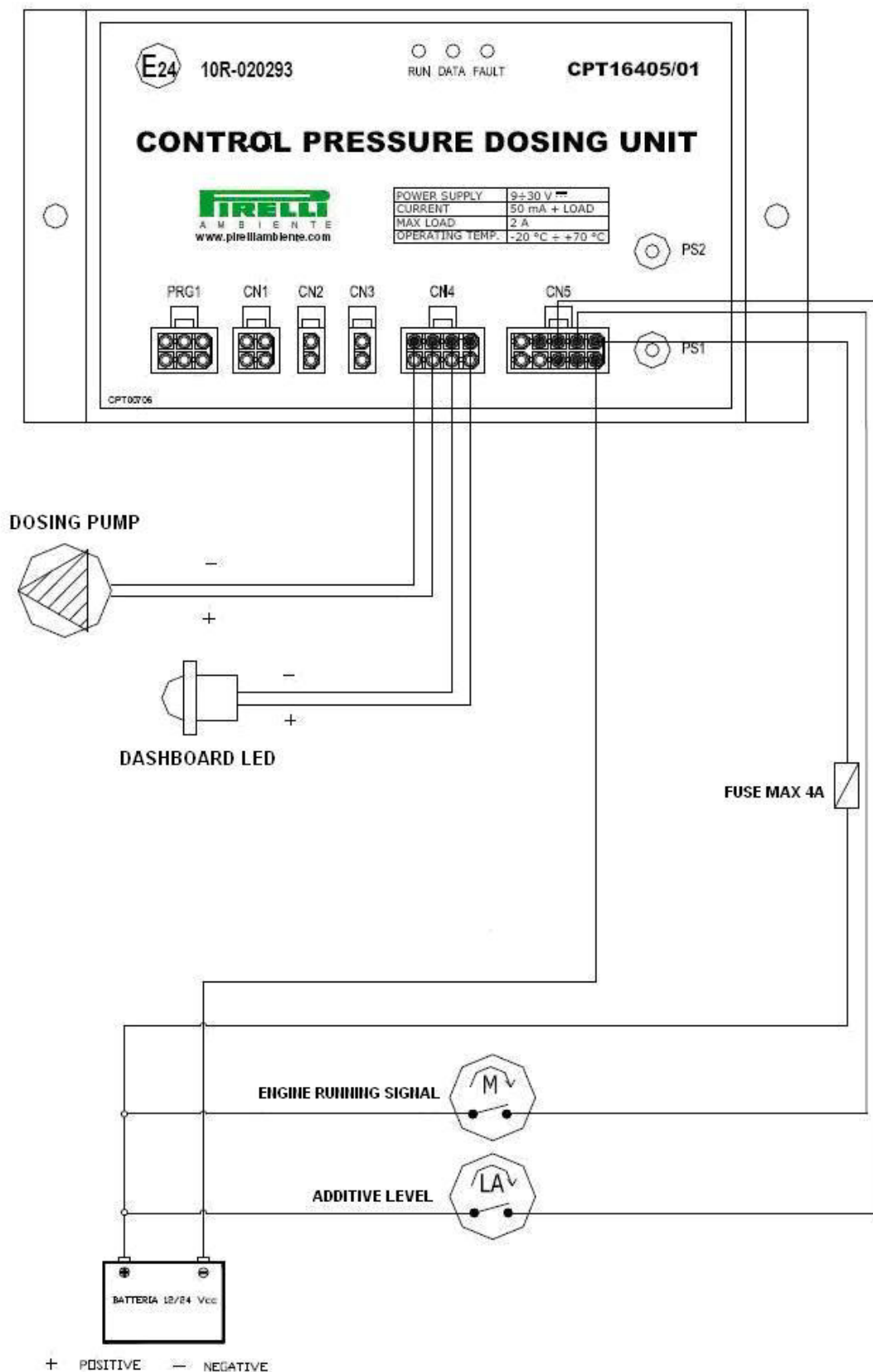
CN3	SPARE 1 OUT		
1	GND	IN/OUT	GND
2	VCC	OUT	CONTROL OUT 250 mA MAX

CN4	SERVICE CONNECTIONS (CPT03606 CABLE)			
1	LED +	OUT	WHITE	DEVICE STATE REMOTE LED 10 mA
2	LED -	OUT	BROWN	DEVICE STATE REMOTE LED 10 mA
3	PUMP +	OUT	BLACK	PUMP ACTIVATION 2 A
4	GND	OUT	BLACK	PUMP ACTIVATION 2 A
5	RELAY OUT	OUT	BLUE	ENABLING RELAY OUT 1 A
6	RELAY OUT	OUT	BLUE	ENABLING RELAY OUT 1 A
7	CAN H	IN/OUT		OPTIONAL CAN BUS CONNECTION
8	CAN L	IN/OUT		OPTIONAL CAN BUS CONNECTION

CN5	ELECTRICAL SUPPLY AND ENTRANCES (CPT03506 CABLE)			
1	9 ÷ 30 VCC	IN	RED	DEVICE ELECTRICAL SUPPLY (BY BATTERY)
2	IN 1	IN	YELLOW	MOTOR IN MOTION IN
3	IN 2	IN	GRAY	LOW LEVEL IN
4	IN 3	IN	BROWN	LEVEL GASOLINE VOLTAGE LEVEL IN
5	OUT 1	OUT		LEVEL GASOLINE CURRENT IN
6	GND	IN/OUT	BLACK	GND
7	IN 4	IN	GREEN	-
8	IN 5	IN		RESERVE
9	IN 6	IN		4÷20 mA CONVERTER VOLTAGE IN
10	OUT 2	OUT		4÷20 mA CONVERTER CURRENT IN

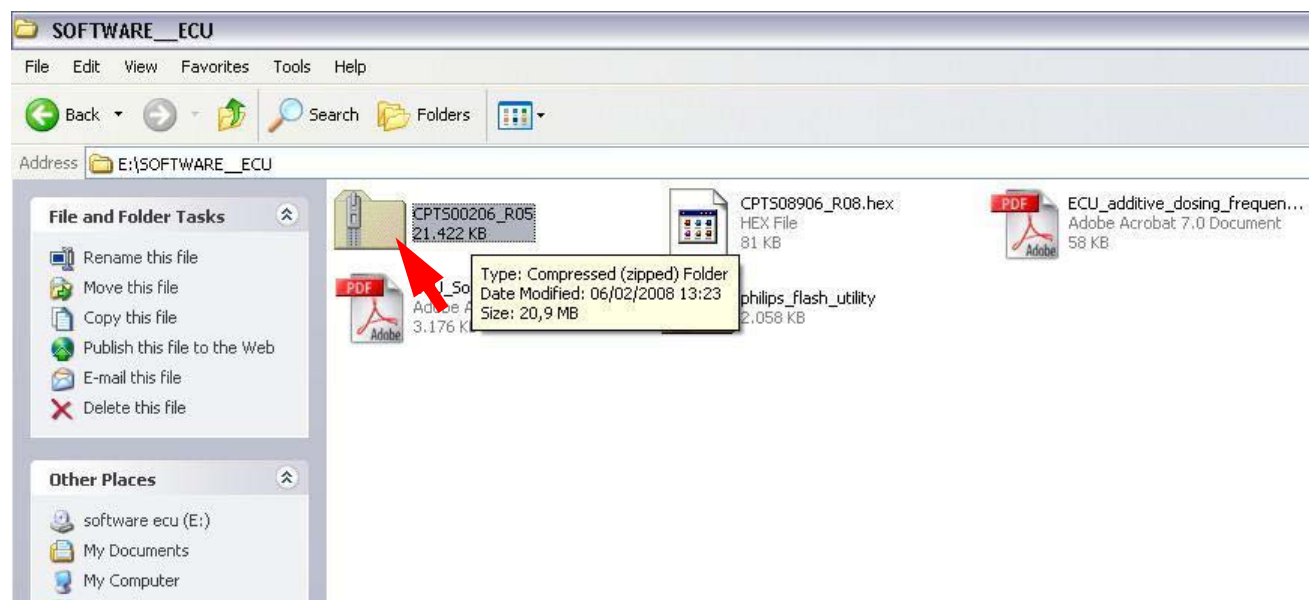
PS1/PS2*	PRESSURE FILTER IN (PS2 is available for 2-sensor CPT16405/01 version only)		
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BASIC CONNECTION DESIGN :



9) Installing the software for managing the electronic control unit (ECU)

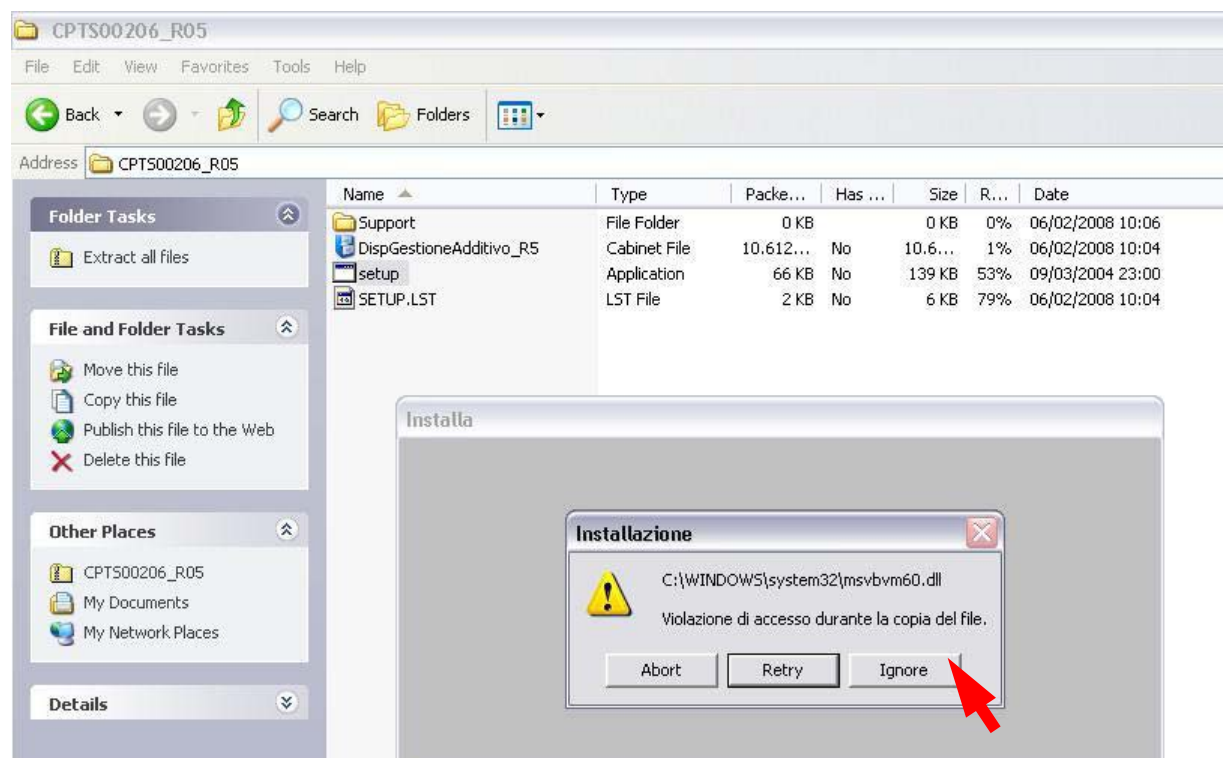
Browse the CD on a laptop PC:



Copy the compressed (zipped) folder named CPTS00206_R0X to the hard disk on the PC and extract it.

Run setup.exe in the folder named C:\.....\CPT00206_R0X.

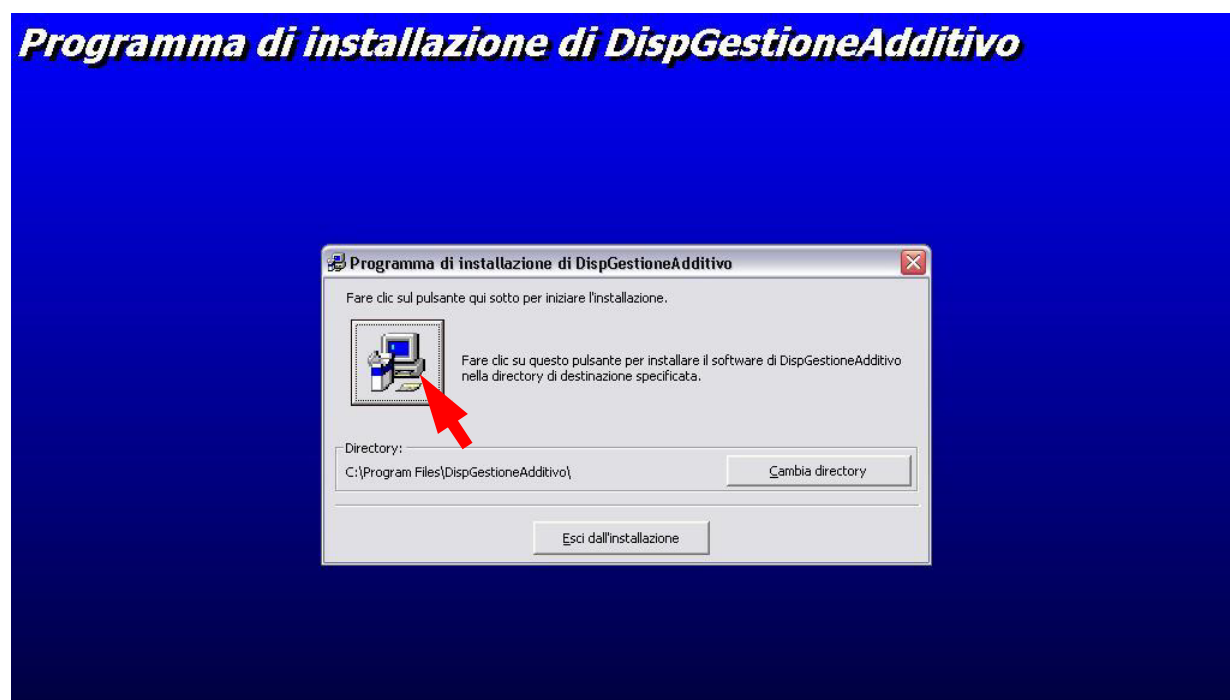
If an error message is displayed, click on "Ignore".



The following screen will be displayed:



The program will begin installation. Click on “OK”.



Choose where to install the program and proceed with the installation by clicking on the button indicated.

Programma di installazione di DispGestioneAdditivo



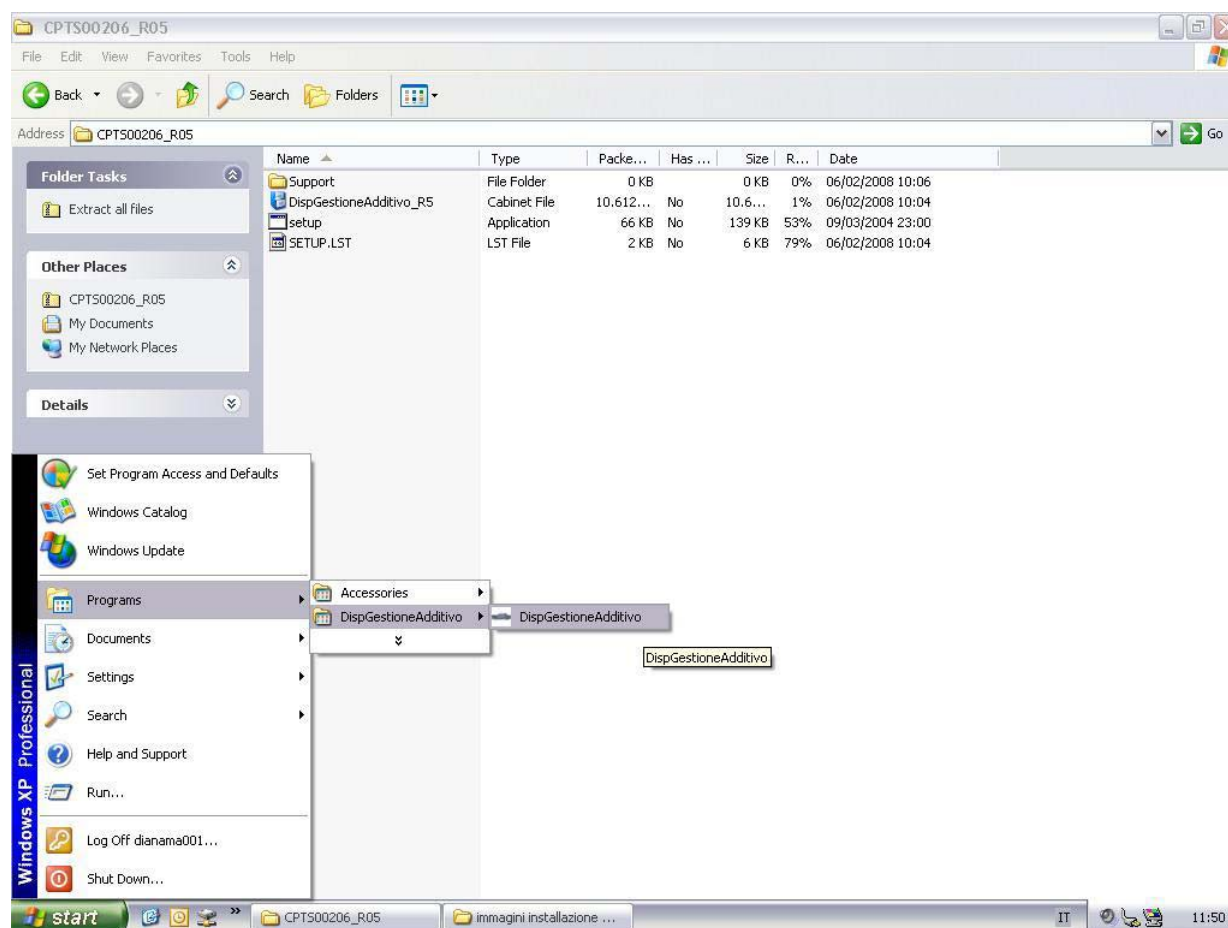
Select “DispGestioneAdditivo” (the additive managing program) and click on Continua.

Programma di installazione di DispGestioneAdditivo



Wait for the installation to finish.

To run the program choose the “DispGestioneAdditivo” icon from the list of programs in Start -> All programs.



10) Operations&Checks to be carried out at the end of the installation

10.1 Dosing the CAM FBC additive into the fuel tank

With the Feelpure™ system (in the version with on-board additive metering system) some cans of CAM FBC catalysing additive are supplied, depending on the capacity of the tank supplied.

To assist the initial regenerations (complete combustion of the carbon accumulated in the particulate filter), you need to dose a preliminary amount of additive into the diesel fuel tank.

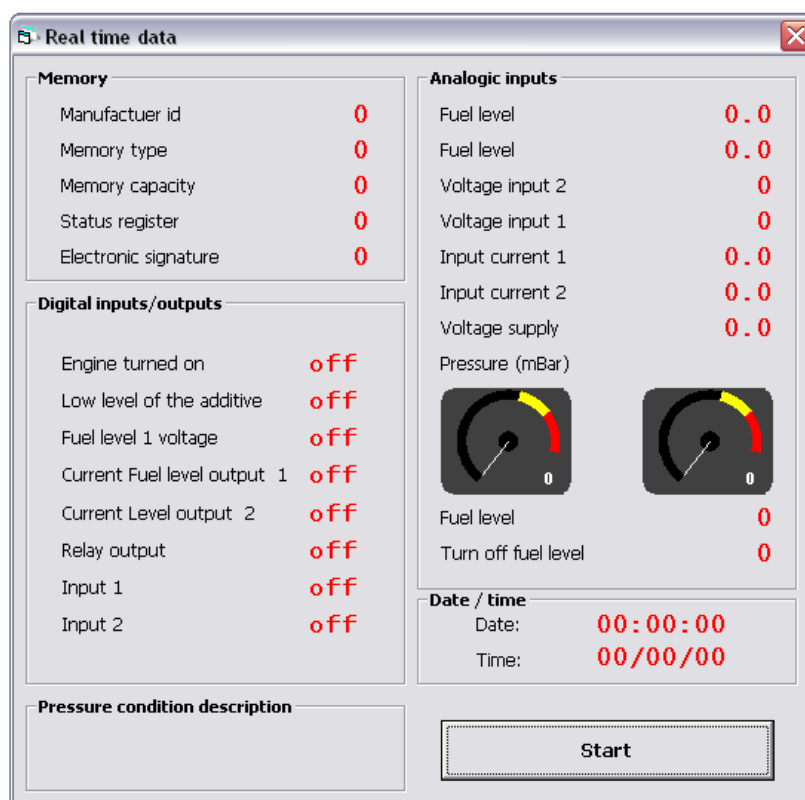
- Pour 0.5 litres of CAM FBC additive directly into the fuel tank (for tanks greater than 500 litres in capacity, increase the amount as follows: 0.1 litres of FBC for every extra 100 litres of diesel).
- Fill the additive tank with the remaining quantity supplied with the system, taking care to use a funnel with a metal mesh filter (10-15-20 litres depending on the application).

10.2 Functioning tests of the electrical wiring

- Check that when the engine is turned on, the driver's LED indicator shows a fix green light. When the engine is switched off, the LED must not be illuminated.

10.3 Functioning tests of the backpressure control system

- Connect the laptop PC to the control unit via the supplied cable.
- Launch the program: *DispGestioneAdditivo_R5.exe*
- Click on VIEW and then click on REAL TIME DATA. The following screen will be displayed:



- 1 Click on START. It is possible to verify that the voltage of the control unit's power supply is correct (the 12/24V value will be displayed by the ECU).
- 2 Start the engine. You can now verify, in the following order:
 - That the control unit correctly receives the engine running signal, "engine turned on" – (ON)
 - That the control unit correctly receives the “low additive level signal” – (OFF)
 - The backpressure due to the system at engine idle speed (the value of which will be displayed by one of the needle indicators on the right-hand side of the dialogue window)
 - (When accelerating fully) the backpressure at WOT, as per the previous point

Typically the backpressure values that can be measured will be respectively approx. 10mbar (**Pmin**) and 50mbar (**Pmax**) at installation time. These will gradually increase with use, until the filtering cartridge is replaced for cleaning.

The measured values must be logged on the **Feelpure™ Installation & Warranty Form**.

If it is not possible to get a reading of the backpressure, check that there are no blockages along the line (6mm metal pipe and blue polyurethane pipe) or leaks (check that all threaded joins have been sealed with Teflon® and properly tightened).

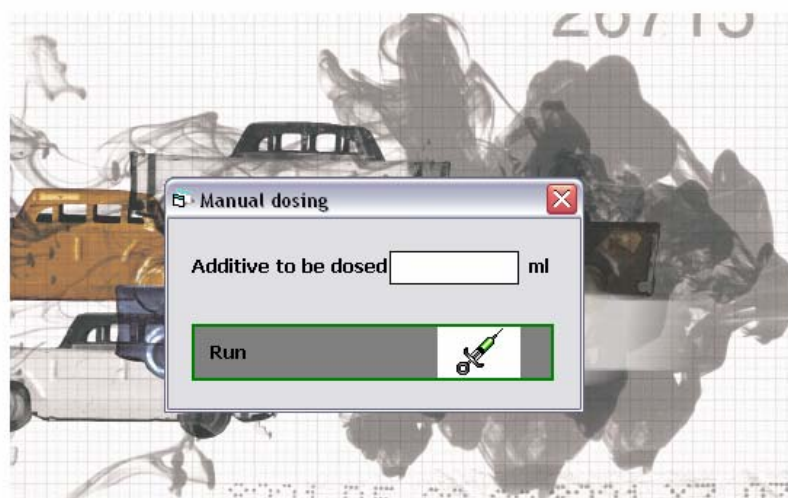
If, after performing these checks, you read the backpressure as 0 mbar, you will have to verify it with a manual pressure gauge. After doing this:

- If the reading from the pressure check shows a value that is different from 0 mbar, contact the supplier of the system to have the control unit replaced.
- If the pressure gauge confirms the value of 0mbar, contact the supplier of the system to have the filter checked to verify it is operating correctly.

If a backpressure level of greater than 80mbar is read at engine idle speed, contact the supplier of the system to have the filter checked to verify it is operating correctly.

10.4 Functioning tests of the additive dosing system

1. Connect the laptop PC to the control unit via the supplied three-wire cable.
2. Launch the program: *DispGestioneAdditivo_R5.exe*
3. Start the engine and let it at the idle speed.
4. Check that the stopcock on the outflow of the additive tank is open (see diagram in section 4.)
5. Click on OPERATIONS and then click on MANUAL DOSING. The following screen will be displayed:



filtri per particolato Pirelli Ambiente

FilterDATA
software versione 1.0

1. In the appropriate field on the screen, enter the amount of additive necessary to get the additive come out from the end of the Parker hose that has to be connected to the diesel line (see section 6). As a rule, 20ml of additive is needed to bleed every metre of additive Parker hose.
2. Click on the RUN icon. It looks like a syringe.

3. Verify that the pump is metering the additive and wait for additive to come out of the hose, using an adequate container to catch excess liquid.
4. If the pump is not working, check that you have followed the procedure correctly and also check the electrical connections (see section 7).
5. While the pump is operating, check that there are no leaks along the line.

10.5 Setting the additive dosing time/frequency

Depending on the vehicle's average diesel consumption, you need to meter in the adequate quantity of additive necessary to allow filter regeneration take place (complete combustion of the carbon accumulated in the filtering cartridge). Adjusting this parameter is vital for the Feelpure™ system to work properly. The default value entered in the ECU "REGISTERS/SETTINGS" is 10 seconds.

For example, for a bus with a "urban-city" mission and with a 270 hp engine (avg. speed = 13km/h), a metering time of 13 seconds is needed.

In the same way, for a truck with a 420 hp engine (avg. speed = 60km/h – average consumption 3 km/litre), a metering time of 7 seconds must be set.

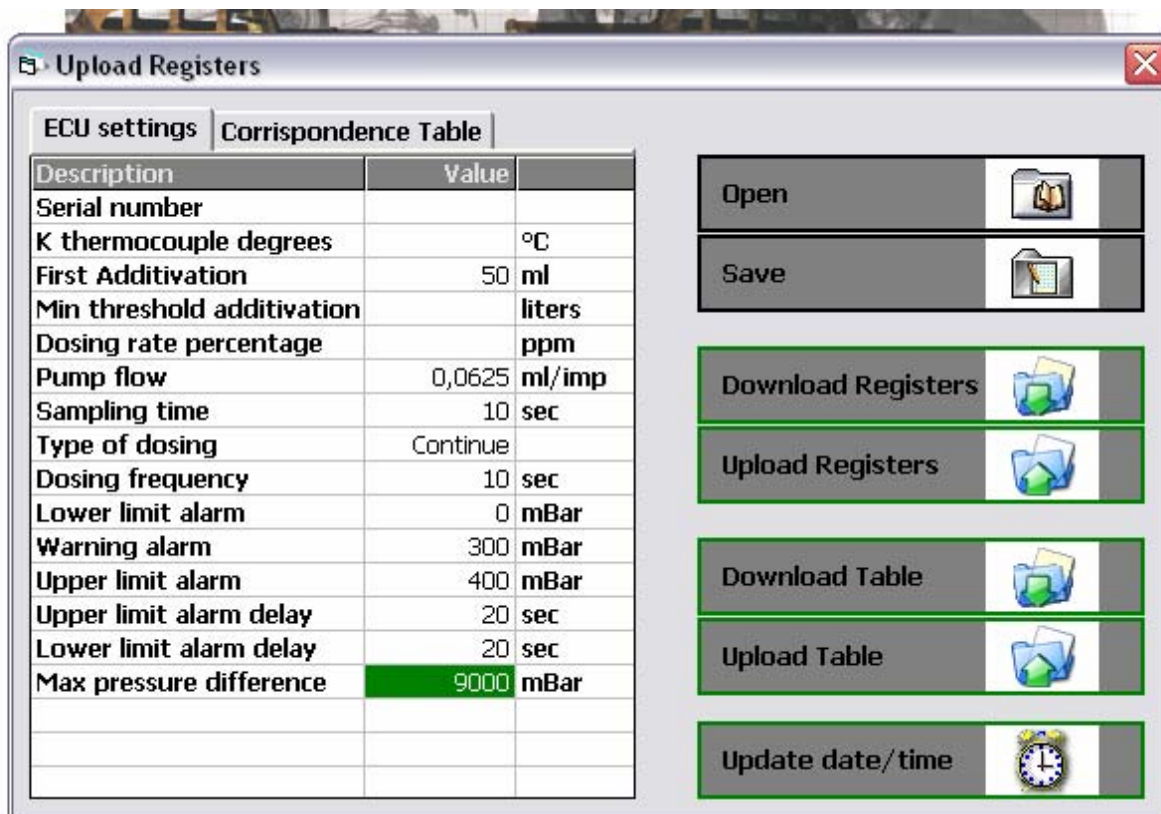
For a "3.5 tons commercial vehicle" with a 100 hp engine (urban mission) a metering time of 25 seconds must be set.

To calibrate the desired value, find the average speed at which the vehicle is used (in km/h) and the average fuel consumption (in km/litre). With these two values you can calculate the average consumption in litres/hour and then use the table on page 31 to calculate the dosing time/frequency.

As a guide, use the three examples given here to verify the result of your calculation. A simple proportion of the engine powers described (expressed in horsepower) helps you to avoid over-metering or under-metering the additive.

To modify the additive metering time in the REGISTERS of the system's electronic control unit, follow this procedure:

1. Connect the laptop PC to the control unit via the supplied cable.
2. Launch the program: ***DispGestioneAdditivo_R5.exe***
3. Click on OPERATIONS and then click on UPLOAD. The following screen will be displayed.
4. Click on DOWNLOAD REGISTERS. Verify that the REGISTERS values conform to those given below.
5. Modify the "DOSING FREQUENCY [sec]", by entering the desired value.
6. Click on UPLOAD REGISTERS (to store the new value).
7. Disconnect and reconnect the CN5 plug/connector on the control unit.
8. Click on DOWNLOAD REGISTERS to verify that the changes you have made have been stored correctly.
9. Click on "UPDATE DATE/TIME"
10. Close the dialogue window and stop the software ***DispGestioneAdditivo_R5.exe***.



Description	Value	
Serial number		
K thermocouple degrees		°C
First Additivation	50	ml
Min threshold additivation		liters
Dosing rate percentage		ppm
Pump flow	0,0625	ml/imp
Sampling time	10	sec
Type of dosing	Continue	
Dosing frequency	10	sec
Lower limit alarm	0	mBar
Warning alarm	300	mBar
Upper limit alarm	400	mBar
Upper limit alarm delay	20	sec
Lower limit alarm delay	20	sec
Max pressure difference	9000	mBar

Any unauthorised operation on the functional parameters/registers of the electronic control unit will void the warranty.

10.6 Verifying the filtering efficiency of the Feelpure™ system

1. With a smoke meter, perform the smoke opacity test of the exhaust gases.
2. Compared to the value taken before installation (which must be less than $K = 1.7 \text{ [m}^{-1}\text{]}$), a substantial reduction can be measured (up to over 90%). Bear in mind, however, that the reading taken at end of installation is not definitive. This is due to the filtering cartridge being "run in" and, because of this, the maximum filtering efficiency is reached after around 2/300 km of running.

If you did not take the smoke opacity reading before installation, you can still do it by removing the 1”1/4 threaded sleeve installed on the exhaust gas inlet endcan of the Feelpure™ muffler.

10.7 “Feelpure™ Installation & Warranty form” fill-in rules

All the readings taken (smoke opacity, backpressure, dosing time, kilometres at installation time etc.) are necessary for filling in the installation & warranty form (enclosed, see page 35), together with the vehicle information contained on the registration certificate and the codes on the plates of the following:

- Filter (filtering cartridge)
- Muffler inlet endcan
- Electronic control unit

The Feelpure™ installation form must be filled in, stamped and countersigned by the workshop that installed the system and by the owner of the vehicle, and must be kept on board the vehicle together with the other identification documents.

A copy of the document (hardcopy or in electronic format) must be sent to Pirelli Eco Technology by fax [+39.02.938.74.664](tel:+39.02.938.74.664) or by e-mail service.ecotechnology@pirelli.com and must subsequently be sent by post within 5 working days of the date of installation.

A copy of the document must also be kept by the installer.

This is essential for the warranty to be recognised by the Pirelli Eco Technology organisation, based on the regulations that govern it.

To follow the maintenance programme specified by the vehicle/engine Manufacturer is essential for the product to be used correctly and in conformance with Pirelli recommendations. This is therefore an essential precondition in order to be able to get the warranty under the terms of the “sale and use” conditions.

Failure to complete the installation form will void the maker's warranty.

11.2 Scheduled maintenance

A necessary condition for the Feelpure™ system to work is to systematically follow the maintenance plan specified by the vehicle/engine Manufacturer.

It is necessary to guarantee that:

- The smoke opacity of the exhaust gases measured upstream of the filter is lower than 1.7 K [m-1]
- The lube-oil consumption is lower than 800g/1000 km (0.25% of the fuel consumption)
- The temperature of the exhaust gases at the inlet of the muffler must be kept at over 300°C for at least 5% of the time the engine is in use

The operations to be performed specifically for the Feelpure™ system are the following:

- Verify backpressure upstream of filter at least every 60,000 km
- Check/replace the “ECU protection” gas filter at least every 60,000 km
(installed on the socket where manually measure the backpressure)
- Cleaning/replacing the particulate filter: annually (and in any case whenever alerted by the dashboard LED)
- Check additive level and refill at least every 60,000 km
(and in any case whenever alerted by the dashboard LED)
- Replacing additive filter (downstream of the metering pump) at least every 60,000 km

The spare parts that may be necessary are the following:

- | | PART CODE |
|---|----------------------------|
| • “ECU protection” gas filter | 5150000010 |
| • additive filter (downstream of the metering pump) | 5150000037 |
| • Filter/endcan gaskets (IN-OUT) | 5500000072 (7,5” diameter) |
| | 5500000005 (10” diameter) |
| | 5500000011 (11” diameter) |

In addition to the above, should there be an engine breakdown (such as a failed turbo, fuel-pump or injector) which can generate a large amount of soot in a short time period, the filter should be inspected and, if required, cleaned.

In terms of importance, the Feelpure™ system could be considered on the same level with all the other auxiliary systems (lubrication, air intake, diesel injection, braking system etc.) and therefore we recommend you add the list of operations and checks described above in the maintenance plan for your vehicle fleet (i.e. these checks should be done at the regular services planned for every 15-30-45-60,000 km). You should budget approximately 1 hour of additional labour (see next section 11.3).

The checks/repairs/replacements described above must be carried out in observance of the proper technical regulations, taking the necessary safety precautions, and preferably they should be performed at specialised workshops and sending the details of the servicing carried out to Pirelli Eco Technology using the **VEHICLE INSPECTION FORM** enclosed (see page 37).

Failure to notify Pirelli Eco Technology of the operations carried out will result in the termination of the warranty.

11.3 How to carry out diagnoses on Feelpure™ system - filling in the Vehicle Inspection Form

When filling in the **VEHICLE INSPECTION FORM** you must include the information on the **INSTALLATION & WARRANTY FORM** about the vehicle, the distance travelled and the smoke opacity of the exhaust gases logged by the installer.

The **backpressure check** can be done using the **Pirelli software** supplied (see instructions given in section 10.3 of this manual) or using a **manual pressure gauge** connected to the manual socket (see section 5.2).

The value must be read when the engine is at idle speed (**Pmin**) and then at WOT condition (**Pmax**).

The **additive level** in the tank can be easily measured manually.

Tank Model	A20	BY15	BY10	BY5
Capacity [litres]	20	15	10	5
Litres per centimetre	1,2	1,6	2,5	3

If the additive is refilled, this must be logged on the form. Requests for additive may be sent to any of the network of workshops authorised by Pirelli Eco Technology (a list is available on the internet website www.pirelliecotecnology.com) and using ordering code **5000000027** for **5-litre cans** or ordering code **5000000026** for **200-litre steel drums**.

If the data in the electronic control unit is downloaded (in the OPERATIONS menu, select DOWNLOAD) you can display and save 3 files that describe the operation of the Feelpure™ system: **REGISTERS, PRESSURE LOG, EVENTS LOG**. These files can be converted/exported in **Excel format (.xls)** and if required they can be sent by email to service.ecotechnology@pirelli.com (in the VIEW menu, select DATABASE and then select the file required and click on the EXPORT button).

When displaying the REGISTERS of the control unit you can also read the ADDITIVE TOTALISER (this tells you the number of metered **IMPULSES**, and also the quantity, in **ml**).


You can verify the **operation of the additive pump** with the following procedure:

- Disconnect the additive hose at the "Tee" junction on the diesel intake line (see section 6 of this manual).
- Using the Pirelli software, select MANUAL DOSING. See section 10.4.
- Set the amount to be metered (at least 200ml) and click on RUN.
- Using a calibrated container, verify that the amount of additive metered is correct.

If you find that it is not operating correctly, replace the pump. This can be ordered from any one of the network of workshops authorised by Pirelli Eco Technology (list available on the internet website: www.pirelliecotecnology.com) and the order code is **5150000002** (24V) or **5150000003** (12V).

The **smoke opacity of the exhaust gases** can be measured both upstream (through the 1"1/4 threaded sleeve) and downstream of the filtering cartridge (see section 10.6).

You can **take a sample of diesel from the tank** (500ml) to verify that the correct amount of CAM FBC additive has been metered in. The sample can be sent to Pirelli Eco Technology for laboratory analysis. Make sure it is in a suitable, sealed container, properly packed, and also enclose the product **safety data sheet** with the package.

	FEELPURE™ SYSTEM INSTALLATION, OPERATION AND MAINTENANCE BOOK		"ON-BOARD" dosing version
			Date: 10/06/2008
			Authors: F.Ceriani – F.Attià

11.4 Replacing/cleaning the filtering cartridge

Replacing the filtering cartridge must be carried out in observance of the proper technical regulations and taking the necessary safety precautions. The details must then be sent to Pirelli Eco Technology.

The detailed procedure is:

- Position a suitable lifting/support system under the filter (the weight of the Feelpure™ cartridge varies from 10 to 25 kg depending on the size).
- Remove the locking V-clamps (via the threaded connections held with nut & locknut).
- Detach the filtering cartridge.
- Replace the gaskets positioned between the cartridge and the inlet/outlet endcans.
- Attach the replacement cartridge.
- Reattach the locking V-clamps (the tightening torque required is 15Nm).

When the operation is finished, the backpressure must be verified using the **Pirelli software** supplied (see instructions given in section 10.3 of this manual) or using a **pressure gauge** connected to the manual socket (see section 5.2).

Whenever the filtering cartridge is detached/reattached, **you must log the serial number (s/n) of the removed filter and the replacement filter on the VEHICLE INSPECTION FORM** (the serial number is on the metal plate welded to the cartridge).

The form must be filled in, stamped and countersigned by the workshop that performed the maintenance operation and by the owner of the vehicle. A copy of the document must be kept on board the vehicle with the vehicle's other identification documents, together with the Installation & Warranty Form.

A copy of the document (hardcopy or in electronic format) must be sent to Pirelli Eco Technology by fax [+39.02.938.74.664](tel:+39.02.938.74.664) or by e-mail service.ecotechnology@pirelli.com and must subsequently be sent by post within 5 working days of the date of inspection.

A copy of the document must also be kept by the workshop that carried out the check/diagnosis.

For further information contact Pirelli Eco Technology Customer Assistance by email at this address:
service.ecotechnology@pirelli.com

Failure to notify Pirelli Eco Technology of the operations carried out will result in the termination of the warranty.

Average fuel consumption [liters/hour]	Dosing frequency [sec]
5	29
6	24
7	21
8	18
9	16
10	14
11	13
12	12
13	11
14	10
15	10
16	9
17	8
18	8
19	8
20	7
21	7
22	7
23	6
24	6
25	6
26	6
27	5
28	5
29	5
30	5
31	5
32	5
33	4
34	4
35	4
36	4
37	4
38	4
39	4
40	4
41	4
42	3
43	3
44	3
45	3
46	3
47	3
48	3
49	3
50	3

FEELPURE™ INSTALLATION & WARRANTY FORM

MAKE A COPY and FAX TO : +39 02 938 74 664

MAIL: service.ecotechnology@pirelli.com

SEND BY POST WITHIN 5 WORKING DAYS OF THE INSTALLATION DATE TO START THE WARRANTY PERIOD (SEE THE MANUAL BACKSIDE)

CUSTOMER/VEHICLE OWNER:

ADDRESS: _____

CONTACT Mr. _____

TEL/FAX: _____

MAIL: _____

VEHICLE DATA:

PLATE: _____ VEHICLE N°: _____

VEHICLE MANUFACTURER: _____

VEHICLE MODEL: _____

ENGINE MODEL: _____

POWER: _____ [KW]

DISPLACEMENT: _____ [LT]

STATEMENT BEFORE INSTALLATION

SMOKE OPACITY (m-1): _____ KM/HOURS: _____

FEELPURE™ SYSTEM DATA

MUFFLER (SEE THE WELDED PLATE ON THE INLET CAN)

TYPE: _____

SERIAL NUMBER: _____

PRODUCTION DATE: _____

FILTER CARTRIDGE (SEE THE WELDED PLATE):

TYPE: _____

SERIAL NUMBER: _____

PRODUCTION DATE: _____

ELECTRONIC CONTROL UNIT (SEE THE BACKSIDE):

VERSION: _____

SERIAL NUMBER: _____

PRODUCTION DATE: _____

ADDITIVE TANK:

MODEL*: _____

CAPACITY*: _____

FIRST FILLING: _____ [cm]* _____ [lt]

ADDITIVE DOSING (SEE ADDITIVE DOSING FREQUENCY ON THE USER'S MANUAL):

AVERAGE FUEL CONSUMPTION (km/lt): _____ AVERAGE SPEED (km/h): _____

AVERAGE FUEL CONSUMPTION = $\frac{\text{Average speed [km/h]}}{\text{Average fuel consumption [km/lt]}}$ = _____ [lt/h] DOSING TIME TO SET (SEC): _____

STATEMENT AFTER INSTALLATION

SMOKE OPACITY (m-1): _____

BACK PRESSURE :

MEASURED BY:

IDLE: _____ [mbar] ☐ PRESSURE GAUGEWOT: _____ [mbar] ☐ ECU SOFTWARE

NOTES: _____

I declare that I have received the Feelpure(TM) installation manual,
the CAM FBC additive safety sheet and the CD with the ECU managing software.
I have read, understood and accepted their contents

INSTALLATION DATE: _____

INSTALLER SIGNATURE & STAMP :

VEHICLE OWNER SIGNATURE & STAMP :



FEELPURE™ SYSTEM INSPECTION FORM

ECO TECHNOLOGY

MAKE A COPY and FAX TO : +39 02 938 74 664

OR MAIL: service.ecotechnolgy@pirelli.com

SEND BY POST WITHIN 5 WORKING DAYS OF THE INSTALLATION DATE TO START THE WARRANTY PERIOD (SEE THE MANUAL BACKSIDE)

COMPLAINT DATE: _____	INSPECTION DATE: _____
CUSTOMER: _____	
VEHICLE MODEL: _____	PLATE / ID.NUMBER: _____
MILEAGE/HOURS AT COMPLAINT: _____	MILEAGE/HOURS AT INSPECTION: _____
INSTALLATION DATE: _____	MILEAGE/HOURS INSTALLATION: _____
SMOKE OPACITY BEFORE INSTALLATION: _____	

SYSTEM BACKPRESSURE CHECK:

Pmin: _____ Pmax: _____ (VERIFY AT IDLE SPEED AND WOT)

DASHBOARD LED STATUS:

☐ GREEN ☐ FLASHING GREEN ☐ FLASHING RED ☐ RED

SAMPLE FROM FUEL TANK: ☐ YES ☐ NO

SMOKE OPACITY: _____ (BEFORE FILTER) _____ (AFTER FILTER): _____

ADDITIVE LEVEL: _____ [CM] AFTER REFILLING: _____ [CM]

ECU ADDITIVE TOTALIZATOR (DOWNLOADED VALUE)*: _____ IMPULSE: _____ ml

ECU DOWNLOAD: ☐ SETTINGS* ☐ PRESSURE LOG* ☐ EVENTS LOG*

SPARE PARTS USED:

REMOVED FILTER CARTRIDGE S/N: _____ INSTALLED FILTER CARTRIDGE S/N: _____

REMOVED ECU S/N: _____ INSTALLED ECU S/N: _____

☐ ADDITIVE FILTER ☐ "ECU PROTECTION" GAS FILTER ☐ FILTER GASKETS
☐ DOSING PUMP ☐ ELECTRONIC CONTROL UNIT ☐ ADDITIVE LEVEL GAUGE/SENSOR

NOTES/COMMENTS: _____

INSPECTOR SIGNATURE AND STAMP:

VEHICLE OWNER SIGNATURE AND STAMP:

* Not mandatory



ECO TECHNOLOGY

WWW.PIRELLI.COM

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